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# Impact of Supply Chain Risk Management on Organizational Performance: Moderating Role of Supply Chain Integration

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## Abstract

This study helps to investigate the relationship between supply chain risk management (SCRM) and organizational performance. The study also examined the moderating role of supply chain integration (SCI) between SCRM and operational performance. The research design is quantitative. The methodology adopted in this study is survey – based methodology. It is used on the data collected from public sector organizations of Pakistan. Tool used for data collection is questionnaire. The results of the study indicate that there is a positive relationship of the SCRM with operational efficiency and operational flexibility. And also, it also has direct and indirect positive impact on the organizational performance. Moreover, supply chain integration (SCI) moderates positively the impact of SCRM on OE and OF. It contributes to the existing studies about the SCRM and SCI by explaining and analysing some more aspects of SCRM. It also helps to improve managerial insight for risk management and supply chain integration as well.

Keywords: Supply Chain Risk Management (SCRM); Customer Satisfaction; Supply Chain Integration (SCI); Operational Performance (OP)

## 1. Introduction

Nowadays, businesses are interlinked by modern supply chains. Supply chain is a combination of different activities, which performed together, adds value in designing, manufacturing or distribution processes of products and/or services and further includes the provision of after sale services for ensuring customer satisfaction (Wagner and Sweeney, 2010). Organizations realize that an efficient competitive supply chain is the substantial requirement for making long lasting relationships and profits in worldwide marketplace (Li et al., 2006). It is a strategic weapon against the competitors, which streamlines the overall operations of the companies (Wagner and Sweeney, 2010). The stronger integration between different stakeholders of whole supply chain and outsourcing increases the dependency on others. Hence it can cause disruption of any one or more supply chain functions and thus disturb the operational performance of the supply chain (Rangel et al., 2015).

The dependence of the firms on the complex networks of other stakeholders is gradually increasing for the delivery at right time, quality, quantity, place and cost (Datta and Christopher, 2011). The SCI provides competitive advantage to the firms. Besides such benefits, some potential risks are also attached with these integrated functions (Breuer et al., 2013). In this context, Supply Chain Risk Management (SCRM) has become a growing field of research for academics and practitioners of SCM studies (Ghadge et al., 2012).

Previous studies defined the SCRM as: "*A process of detecting, monitoring and mitigating the risks to supply chain by using different coordinated techniques*." (Kauppi et al., 2016).

SCRM is beneficial for the organizations by reducing the causes of supply chain disruption and lowering the operational accidental losses (Shou et al., 2018; Manuj et al., 2014). However, additional investment in form of additional inventories, alternate transport, extra suppliers, and more capabilities is required to implement SCRM (Shou et al., 2018; Kauppi et al., 2016; Bode and Wagner, 2015) and thus it may have a strong impact on the financial performance.

Previous studies prescribed SCRM for the organizations to achieve better organizational performance (Manuj et al., 2014). This achievement may be in terms of financial benefits in corporate sector (Manuj et al., 2014). But study of impact of SCRM in public sector organization is still lacking in recent literature. Therefore, this paper aims to investigate the relationship between SCRM and organizational performance in public sector organizations. Another objective is to investigate the moderating role of the SCI on the relationship of SCRM on operational performance in terms of efficiency and flexibility of the public sector organizations.

This study will contribute to the improvement of organizational performance in public sector organizations by focusing on SCRM techniques. This research will help to investigate the role of SCI in SCRM for improvement of organizational performance. Furthermore, this research will help all stakeholders of supply chain at different levels in order to minimize the risk impact at overall supply chain process. The outcomes of this study are improvement in SCRM techniques and introducing new ways to minimize supply chain disruption. It will enable managers to decrease supply chain costs and enhance the performance.

## 2. Theoretical background and research hypotheses

Based on the Information Processing Theory(IPT) this paper aims to explore the relationship between SCRM and organizational performance along with the moderating impact of SCI. IPT identifies that the organizations can encounter the risks and uncertainties and enhances the organizational performance through increasing the capability or reducing the requirement of the information processing. SCRM is information intensive practice which involves all the stakeholders including suppliers and helps to enhance the performance of the organization (Shou et al., 2018). It should be equipped with SCI (supply chain integration) in order to collect and process precise and well-timed information and improve the capabilities of information processing.

### *2.1. Supply chain risk management and integration*

SCRM is the management of these factors to mitigate negative impact (Rangel et al., 2015). The key barriers that obstruct the achievement of operational efficiency are external and internal risks (Ebben and Johnson, 2005). Faulty decisions, lack of information can result into huge losses of finances and time. The efficient SCI is advantageous for increasing operational flexibility and operational efficiency (Kauppi et al., 2016). The highly secured, controlled and stable environment is helpful for acquiring better operational efficiency (Shou et al., 2018). These techniques create a reliable environment in the organizations which helps to improve operational efficiency (Ebben and Johnson, 2005). SCRM practices help to investigate, evaluate and control the potential factors of the risk in the organizations and in the supply chain (Narasimhan and Talluri, 2009).

Operational flexibility is the capability of the firm to react in supply and demand changes. SCRM helps to enhance supply chain flexibility with the help of SCI which resolve the information related problems (Shou et al., 2018). Organizations have to adapt customized requirements by operational flexibility to compete in the market in competitive and changing environment (Patel, 2011).

Operational efficiency increases when the production activities of an organization are performed with lower operational cost and high profits. In case of public sector organizations, efficiency and performance are not measured in financial terms. So, it can be measured in terms of reliability, functionality, controlled environment and customer satisfaction.

SCI is the degree to which the manufacturer or the organization collaborates with its supply chain partners. It is used to manage internal and external organizational processes. Zhao et al. (2008) explained the concept of SCI as, "*the degree to which an organization strategically collaborates with its supply chain partners and manages intra and inter-organization processes in order to achieve effective and efficient flows of products and services, information, money, and decisions with the objective of providing the maximum value to the customer at low cost and high speed*" (Zhao et al., 2008, p. 374). Flynn et al., (2010) identified two major dimensions of SCI i.e. internal SCI (II) and external SCI (EI). External SCI is again divided into two dimensions i.e. supplier integration (SI) as an upstream SCI dimension and the customer integration (CI) as a downstream SCI dimension. Many studies define SCI as three dimensional with customer integration, supplier integration and internal integration (Zhao et al., 2013).

### *2.2. Hypothesis development*

According to some researchers, supply chain risk has negative impact of logistics performance (Simangunsong et al., 2012; Sanchez-Rodrigues et al., 2010). Whereas, some other studies like Saminian-Darash and Rabinow (2015) concluded that SCR may enhance the performance due to its positive effect in future. On the other hand Merschmann and Thonemann (2011) argued that there is no relation between performance and risk. Moreover, the previous studies explored the firm performance in only logistics services organization (Wang, 2018) or manufacturing sector organizations (Shou et al., 2018). This study tries to explore this relationship in public sector organizations. So the first hypothesis will be:-

**H1.** SCRM is positively associated with organizational performance.

The SCRM contributes to operational performance by making response faster and decreasing the operational loss (Manuj et at., 2014). This research focuses these two features of operational performance in public sector organizations. Organizations can enhance their actions to contingencies in terms of response and time by making quick decisions with existing information (Shou et al., 2018). The enhanced flexibility and improved responsiveness can be achieved by excellent capabilities of information processing. So our second hypothesis is:-

**H2:** SCRM has positive impact on the (a) operational efficiency (b) operational flexibility.

Both operational flexibility and operational efficiency enhances the organizational performance. These are the competitive advantages of any organization that provides various products with cheaper prices and in shorter lead time (Kortmann et al., 2014). Some studies discussed that delivery dependability, speed of delivery and volume flexibility improved the return on investment (ROI), return of sales (ROS) and hence growth in sales (Vickerya and Marklandb, 1997). Yu et al. (2012) discovered that greater financial performance and customer satisfaction can be achieved by operational performance. It is performed by reducing delivery cost and services

and delivering quality products to the customers. There exists a positive impact of efficiency and delivery speed on financial performance and market share (Droge et al., 2004). Conclusively, operational efficiency makes the firms to perform the logistics tasks along with saving cost and time, and boost the organizational performance (Liu & Lai, 2016). In other words, we can say that operational efficiency and operational flexibility mediates the relationship between SCRM and organizational performance. So the proposed hypotheses are:

**H3a:** Operational Efficiency mediates the relationship between SCRM and organizational performance.

**H3b:** Operational Flexibility mediates the relationship between SCRM and organizational performance.

Previous studies revealed the relation of operational efficiency and operational flexibility with financial performance. The public sector organizations operate on No profit No loss basis. The organizational performance is measured in terms of customers' satisfaction, reduction of cost and time. So this study will focus on these values to measure organizational performance instead of financial performance. A positive relation of SCI with operational performance was noticed in previous studies related in the manufacturing companies and business performance (Mackelprang et al., 2014; Leuschner et al., 2013). In this study we investigate how supply chain integration can improve the SCRM progress on operational efficiency and operational flexibility of public sector organization. SCI is divided into three dimensions i.e. customer integration, supplier integration and internal integration (Shou et al., 2018). The proposed hypothesis will be:-

**H4a.** The supply chain integration moderates positively the relation of SCRM and operational efficiency.

**H4b.** The supply chain integration moderates positively the relation of SCRM and operational flexibility.

Figure 1 captures the research model underpinning this study.

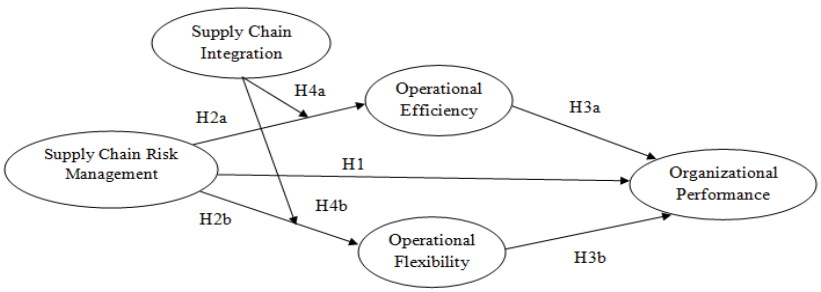


**Figure 1.** Research model

## 3. Research design

A survey was conducted in order to collect data. The questionnaires were distributed to 400 employees in different cities of Pakistan. Only 221 responses were received. After scrutiny, 208 were found valid for tests. The questionnaire consisted of two parts. Part one inquired about the demographic information while the second part had five sections related to research variables.

### *3.1. Measures*

SCRM had four items. It was adopted from Shou et al. (2018). Three dimensions were taken for SCI i.e. supplier integration, customer integration and internal integration in line with previous research by Flynn et al. (2010). The measure of operational efficiency contained seven items adopted from Huo et al. (2014). The scale of operational flexibility is adopted from Trkman et al. (2016) and contained five items. The organizational performance was measured in terms of development in process and product as well, process time cycle and productivity improvement etc. It consisted of eleven items and was adopted from Rai et al. (2006). The construct of customer satisfaction contained four items adopted from Zhao et al. (2013).

## 4. Data analysis

The common method bias (CMB) was checked with Harman's single factor test. Confirmatory factor analysis (CFA) was done in order to measure the internal consistency and validity of the data and those items that had values less than threshold limit were deleted from further analysis. The values of Cronbach's alpha for each variable was checked. The composite reliability value (CR) for each variable was more than 0.7, factor loading of all items was more than 0.5 and it exceeded more than twice of the standard error of respective item (Shah and Goldstein, 2006). It indicated the validity and reliability of the data. The Variance Inflator Factor (VIF) value was less than 3.3 (Diamantopoulos and Sigouw, 2006) and tolerance was more than 0.2. In order to check the discriminant validity Fornell and Larcker's test and HTMT was measured using SmartPLS. The values of

Heterotrait – Monotrait Ratio (HTMT) favoured the validity of the data as all the values were below the threshold value 0.90 (Henseler et al., 2015).

## 5. Results

In order to test the hypothesis H1 – H2, we used SEM. Tests were performed using SPSS 25 and SmartPLS software. The values of the *p* – value and standardised path coefficients are shown in table 5.

**Table 5**. Results of path analysis.

| No | HYP | IV | DV | R Sqr | F | Beta | *T* | Sig | Path |
|---|---|---|---|---|---|---|---|---|---|
| **1** | **H1** | SCRM | OP | 0.214 | 56.125 | 0.481 | 6.913 | 0.000 | 0.303 |
| **2** | **H2a** | SCRM | OE | 0.380 | 126.492 | 0.510 | 11.247 | 0.000 | 0.354 |
| **3** | **H2b** | SCRM | OF | 0.433 | 157.260 | 0.497 | 12.540 | 0.000 | 0.465 |

The results show that SEM model fits well to the data (SRMR = 0.093, d_ULS = 3.485, d_G = 1.259, NFI = 0.578). As we noted that *p* – value for each hypothesis is equal to zero, which shows that all the relations are significant. Moreover, the *t – value* for each relation is also more than 1.96 which confirms the significance of the relations. The results supported the proposed hypotheses H1, H2a and H2b as well.

In order to test the mediating role of operational efficiency (H3a) and operational flexibility (H3b) for the relation between SCRM and organizational performance Model 4 of SPSS extension Process v 3.2 by Andrew F. Hayes (Preacher and Hayes, 2008) is used. The results are presented in Table 6. It shows that all the data collected is significant with $p < .001$ and t – value also verifies the significance of the data. It supports the proposed hypothesis H3a. The *p* – value for relationship between SCRM and OP with mediating variable operational flexibility is .7905. The *t* – value also verifies that the relationship is not significant. So it does not support the proposed hypothesis H3b.

**Table 6**. Mediation analysis.

| Effect | IV | M | DV | Coeff (*b*) | F | *t – value* | *p – value* | $R^2$ |
|---|---|---|---|---|---|---|---|---|
| X → Y path c | SCRM | | OP | 0.4808 | 56.12 | 7.49 | 0 | 0.21 |
| X →M path a | SCRM | | OE | 0.5095 | 126.49 | 11.25 | 0 | 0.38 |
| | SCRM | | OF | 0.4969 | 157.26 | 12.54 | 0 | 0.43 |
| X → M → Y path c’ | SCRM | OE | OP | 0.365 | 25.07 | 3.57 | 0.0005 | 0.27 |
| | SCRM | OF | OP | 0.0311 | 25.07 | 0.27 | 0.7905 | 0.27 |

Moreover, indirect effect is equal to 0.2014 between the confidence intervals .0833 and .3202. According to Null hypothesis, zero is not included between the confidence intervals, which shows that data is significant and it is in favour of proposed hypotheses H3a. The moderating effect of SCI with mediation effect is studied by using SmartPLS. The results are given in table 7. The *p – value* of both interaction relations shows the significance of the data. The *t – value* also supported the results. The confidence intervals verify the significance of the data which supported the proposed hypotheses.

**Table 7**. Moderation Effect of SCI on OE and OF.

| Int | Mean | Std Dev | *t* – Statistics | *p* – value | LLCI | ULCI |
|---|---|---|---|---|---|---|
| SCRM*SCI -> OE | -0.2 | 0.065 | 2.887 | 0.002 | -0.28 | -0.072 |
| SCRM*SCI -> OF | -0.32 | 0.072 | 4.233 | 0 | -0.412 | -0.18 |

## 6. Discussion

This study makes a contribution to investigate the relationship between SCRM, SCI, OE, OF and organizational performance. The results show that all hypotheses are confirmed except H3b which is not supported.

This research will provide knowledge regarding the supply chain risk management in public sector organization. This study contributes to the knowledge regarding the influence of SCI on SCRM in the performance of the public sector organizations. The results show that the implementation of SCRM practices in the public sector organizations may help the employees to reduce the losses by applying SCRM. Initially it may be possible that organizations may face some costs or efforts (Bode et al., 2012; Zhao et al., 2008). But it is an investment which will return benefits in future in terms of better performance of the organization in terms of productivity, services (Sodhi et al., 2012). This study extends the previous work about the relation of SCRM with operational performance (Kauppi et al., 2016; Fan et al., 2017; Shou et al., 2018) by expanding the study about the public sector organizations.

This study also explains the relationship of the SCRM with operational flexibility and operational efficiency with the help of IPT. As per IPT, SCRM strategies increase the ability of information processing and problem-

solving capacity with the help of information sharing and operational buffers. This rapid information processing and sharing can enhance the capability of the organization to respond quickly to the customized demands and upstream disruption. The results of this study suggest that the firms may be able to respond to the diversified demands of the customers by applying SCRM processes in their organizations efficiently. This is possible due to the relationship between the SCRM and operational performance. In this study, SCI is identified as a moderator of the relationship between SCRM and operational performance.

## 7. Conclusion, limitations and future work

This study expands the previous works of different studies about the relationship between SCRM and firm performance by applying IPT theory. This study suggests that SCRM has a direct relation with the operational performance in terms of efficiency and flexibility. This study also suggests that there is an indirect relationship between the SCRM and the organizational performance. Moreover, this study also clarifies the role of SCI in the implementation of SCRM by moderating the operational performance in terms of efficiency and flexibility. This study reveals that SCI enhances significantly the SCRM impact on operational performance in both dimensions i.e. flexibility and efficiency. This study further investigated the different dimensions of SCI and their impact on the relation between SCRM and operational performance. This study suggested that SCI practices should be implemented in public sector organizations, so that they can handle the uncertainties and risks and can improve the operational efficiency and flexibility.

This study also has some limitations which provide the directions for future research. First this research is about the defence public sector organizations of Pakistan. Further studies are required in other sectors of Pakistan. As Pakistan is a developing economy and CPEC will open many doors for different organizations to investment. Moreover, more studies about the attached risks and control are required as well.

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